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RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
AND
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VOL. XI JULY, 1918 No. 4

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A Report of the Work Carried Out at the Radium Institute, London, from January 1st, 1917 to December 31st, 1917.
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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

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RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL. XI JULY, 1918 No. 4

A REPORT OF THE WORK CARRIED OUT AT THE RADIUM INSTITUTE, LONDON,

From January 1st, 1917, to December 31st, 1917.

By A. E. Hayward Pinch, F.R.C.S. Medical Superintendent

This report differs in character from those published in previous years in so far as special prominence is accorded to the after-history of cases examined and treated at the Institute between August, 1911, and December, 1914. The statistical tables concern only the new cases seen at the Institute during the year 1917.

The Committee is of opinion that a useful purpose would be served by bringing before medical practitioners facts which may enable them to form their own opinion as to the value and suitability of radium therapy in the treatment of disease, and more especially of malignant disease.

To form an adequate judgment of the results hereinafter submitted, it is important to remember that the policy of declining to treat operable cases of malignant disease—rodent ulcer alone excepted—has been rigidly adhered to since the inception of the Institute, save only in those instances where the patients have absolutely declined to submit to operation. The cases recorded form but a very small number of those actually treated, and are only given as illustrative of the chief points in the report, but the results have all been verified, either by actual examination of the patients, or by reports from their medical attendants. It has further to be borne in mind that the patients treated at the Radium Institute have come from all parts of the British Isles, that by far the greater number

*An abridged form of the Report, omitting some of the illustrative case histories. Abridged forms of the Reports for 1914 and 1915-1916 appeared in Radium, May, 1915 and August, 1917. Ed.

of them are in necessitous circumstances, and that the disturbance of economic conditions occasioned by the war has rendered the tracing of many of them absolutely impossible.

The term "apparent cure" used in relation to cases of malignant disease, must be interpreted as representing a condition in which all traces of the original lesion or lesions have disappeared, in which there is no sign of any recurrence, and in which the patient is, so far as can be determined by a thorough and careful examination, free from any indication or symptom of the disease.

The strength of all the apparatus used in the treatment of cases is expressed in terms of hydrated radium bromide, a salt the radium element content of which is 53.6 per cent. *

No description of apparatus and technique is given this year, as information on these points can be obtained by reference to the reports published in 1913, 1914, and 1915.

TABLE I.

Summary of Cases.

Examined but not treated	48
Recent report not yet received	35
Prophylactic irradiation only	12
Apparently cured	69
Cured	22
Improved	241
Not improved	104
Abandoned treatment	28
Dead	44
Total	603

6,232 treatments were administered during the year, of which 4,205 were given free of all charge to necessitous patients.

THE TREATMENT OF DISEASE.

EPITHELIOMATA. The after-results of the radium treatment of epitheliomata of small size and affecting glabrous surfaces, when taken at an early stage and before lymphatic infection is evident, have been distinctly encouraging, and when patients have declined to submit to removal by excision, radium therapy may quite justifiably be resorted to. Heavy dosage, usually with unscreened applicators, is adopted, and a destructive reaction produced. In cases which respond favorably a depressed smooth scar at the site of the lesion results, and but little tendency to recurrence has been observed.

With epitheliomata affecting mucous membranes, the results are not nearly so satisfactory, and in most instances, more especially when the lesion is situate in the mouth, tongue, fauces, or œsophagus, must be regarded as disappointing. Disappearance or fibrosis of a small primary lesion in the tongue or buccal mucous membrane is sometimes obtained, and no recurrence having taken place at the original focus of the trouble, the patient and his medical attendant may be induced to believe that the disease has been eradicated. Experience has shown, however, that sooner or later lymphatic involvement makes its appearance, and though the rate of progress of the disease may be checked, pain alleviated, and ulceration retarded, a fatal result ultimately supervenes.

In epitheliomata of the œsophagus definite temporary improvement frequently follows radium treatment of the growth, the stricture becom-

*It is important to bear this in mind, since in the United States dosage is commonly based on the radium element content. Ed.

ing much more patent, so that the patient is enabled to swallow solid food for six, nine or even more months after the exposures. No case of apparent cure persisting for a period of two or three years has, however, yet been recorded, and the treatment is, therefore, to be looked upon chiefly as a palliative measure.

In epitheliomata of the vulva and vaginal mucosa the response is distinctly more favourable, some patients remaining apparently well for many months after the termination of their treatment.

Epithelioma of Right Eye. Case No. 1548, M., aged 80. A circular growth 1 centimetre in diameter on the sclero-corneal margin of the right eye.

Its nature had been determined by microscopical examination. An attempt to remove it by cauterization had failed.

Seen and treated in November, 1914. All trace of it had disappeared by the middle of January, 1915.

The patient wrote on January 13, 1918, "the treatment put my eye quite right, and I have had no trouble since, though I have given it no end of work reading and writing."

Epithelioma of Palate. Case No. 5680, M., aged 78. A growth of the size and shape of half a walnut on the lower part of the left soft palate.

Treated in April, May, and October, 1914, and completely disappeared. Enlargement of lymphatic glands at angle of the left jaw occurred in February, 1915, and patient was being treated for this, but he died suddenly of heart failure early in March, 1915.

Epithelioma of Jaw. Case No. 2290, M., aged 79. The patient developed an epitheliomatous growth around the left lower molar teeth in May, 1916. The teeth were extracted, and attempts at removal of the growth by excision and cautery were made in August and September. Recurrence took place almost immediately. When seen in November, 1916, a hard nodular ulcerated growth occupied the cavity in the left lower jaw, which had resulted from the extraction of the teeth. The surrounding mucous membrane was indurated, hyperaemic, and tender. There was one enlarged gland the size of a hazel nut in the left submental fossa. The patient received treatment in November, 1916, January, March, May and July, 1917. By the end of August the growth had disappeared, and there was no ulceration, induration, or tenderness of the alveolar mucous membrane. The submental gland was no longer palpable.

The patient failed to report himself for examination as frequently as directed, and was not seen again until January, 1918, when he came complaining of a swelling on the left side of his neck, which he said had made its appearance four weeks previously.

Examination showed a mass of hard fixed glands the size of a duck's egg at the left side of neck midway between jaw and clavicle. No trace of the primary growth was appreciable in the mouth. The patient remains under treatment for the enlarged glands.

Epithelioma of Æsophagus. Case No. 1291, M., aged 63. The patient had suffered from steadily increasing dysphagia for ten months before he applied for treatment in April, 1914. He was then able to swallow only liquids with much difficulty. Direct œsophagoscopy revealed an annular vascular ulcerated growth at the level of the tracheal bifurcation.

He was treated in April and June, a powerful emanation tube screened with 1 mm. of silver being passed into the lumen of the growth,

TABLE II.

Classification of Cases.

Disease.	Examined, but not treated.	Result not yet noted.	Received prophylactic treatment only.	Apparently cured.	Cured.	Improved.	Not improved.	Abandoned treatment.	Dead.	Total.
Carcinoma, Squamous-celled:										
Branchial cleft	—	—	—	—	—	1	—	—	—	1
Glabrous skin	3	—	1	2	—	1	3	5	3	18
Buccal, oral, lingual, and pharyngeal mucous membrane	5	—	2	—	—	15	17	4	14	57
Œsophagus	—	—	—	—	—	—	—	—	2	2
Larynx	—	—	—	—	—	1	2	2	—	5
Vagina	—	—	—	—	—	2	—	—	—	2
Vulva	1	1	—	—	—	1	1	—	—	4
Uterus	1	3	—	1	—	22	14	—	5	46
Bladder	—	1	—	—	—	—	2	—	—	3
Anus	—	—	—	—	—	—	1	—	—	1
Nose	—	—	—	—	—	1	—	—	—	1
Carcinoma, Spheroidal-celled:										
Breast	6	2	4	1	—	39	7	2	8	69
Liver and gall bladder	—	—	—	—	—	1	1	—	—	2
Paget's disease	—	—	—	—	—	2	1	—	—	3
Carcinoma, Columnar-celled:										
Large intestine	—	—	—	—	—	—	2	—	2	4
Rectum	1	2	1	—	—	12	8	1	3	28
Stomach	—	1	—	—	—	—	—	1	1	3
Ovary	1	—	—	—	—	—	1	1	—	3
Prostate	—	—	—	—	—	2	1	—	—	3
Parotid	—	—	—	—	—	1	1	—	—	2
Rodent ulcer	—	1	1	52	—	23	3	1	1	82
Sarcomata:										
Spindle-celled	1	—	3	—	—	4	6	1	1	16
Round-celled	—	—	—	1	—	2	1	1	1	6
Melanotic	2	—	—	—	—	1	1	—	1	5
Lymphosarcoma	—	—	—	1	—	2	—	—	1	4
Osteosarcoma	—	—	—	—	—	—	1	—	—	1
Myeloma	—	—	—	—	—	—	1	—	—	1
Endothelioma	1	—	—	—	—	2	1	—	—	4
Lymphadenoma	1	—	—	—	—	7	—	—	—	8
Malignant glands	1	—	—	—	—	3	1	—	1	6
Parotid tumour	1	—	—	—	—	—	1	—	—	2
Abdominal tumour	—	—	—	—	—	—	1	1	—	2
Mediastinal tumour	—	—	—	—	—	—	1	—	—	1
Tumour of orbit	—	—	—	—	—	1	—	—	—	1
Villous tumour of bladder	—	1	—	—	—	1	—	1	—	3

TABLE II.

Classification of Cases.

Disease.	Examined, but not treated.	Result not yet noted.	Received prophylactic treatment only.	Apparently cured.	Cured.	Improved.	Not improved.	Abandoned treatment.	Dead.	Total.
Hypernephroma	—	—	—	—	—	—	1	—	—	1
Cystic disease of ovary...	—	—	—	—	—	—	1	—	—	1
Adenoma (thyroid)	2	1	—	—	—	3	—	—	—	6
Fibromata	1	—	—	—	—	3	—	—	—	4
Lipoma	1	—	—	—	—	—	—	—	—	1
Fibroid disease of uterus	—	—	—	2	—	2	1	1	—	6
Leucoplakia	1	—	—	1	—	1	—	—	—	3
Enlarged prostrate	—	—	—	—	—	1	—	—	—	1
Naevi:										
Capillary	—	2	—	—	6	8	3	1	—	20
Cavernous	—	—	—	—	—	7	1	—	—	8
Moles, warts & papillomata	—	3	—	—	14	5	—	—	—	22
Granuloma	—	—	—	—	—	1	—	—	—	1
Tuberculosis:										
Glands	—	—	—	—	—	3	—	—	—	3
Skin	—	1	—	2	—	9	1	1	—	14
Joints	—	—	—	—	—	—	—	1	—	1
Spring catarrh	—	—	—	—	—	2	—	—	—	2
Chronic Inflammations ..	4	—	—	—	—	1	2	1	—	8
Chronic ulcerations	—	—	—	1	2	1	—	—	—	4
Skin diseases										
Keloid and vicious cicatrices	2	2	—	2	—	12	1	1	—	20
Lupus erythematosus..	—	—	—	—	—	1	1	—	—	2
Psoriasis	1	1	—	—	—	—	—	—	—	2
Pruritus	1	—	—	1	—	1	—	1	—	4
Lichenification of skin	—	—	—	1	—	2	—	—	—	3
Xanthoma	—	—	—	1	—	—	1	—	—	2
General diseases:										
Lymphatic Leukaemia	1	—	—	—	—	1	—	—	—	2
Exophthalmic goitre...	1	3	—	—	—	2	—	—	—	6
Neurasthenia	—	—	—	—	—	1	—	—	—	1
Neuritis	1	—	—	—	—	1	1	—	—	3
Neuralgia	1	1	—	—	—	1	—	—	—	3
Arthritis deformans ..	4	9	—	—	—	24	9	—	—	46
Various	2	—	—	—	—	1	1	—	—	4
Totals	48	35	12	69	22	241	104	28	44	603

and an exposure of fifteen hours' duration given on each occasion. Great local improvement resulted, and the operation of gastrostomy was averted.

His medical attendant reported "the patient died a year and a day after the first application of the radium, from extension of the growth to surrounding parts. As far as the local condition was concerned, the result of the radium treatment was eminently satisfactory, and the patient was able to take food well up to the end. The result was infinitely better than we should have got by a gastrostomy."

CARCINOMA OF THE UTERUS. The prolonged and intense suffering which this disease entails upon its victims, who form such a large percentage of the cases attending gynæcological clinics, is responsible for the great number of applications made to the Radium Institute for the treatment of these patients; but unfortunately, by far the larger number present themselves at a stage when the disease is very far advanced, and infiltration of the broad ligaments, of the recto-vaginal, and vesicovaginal septa is pronounced, and infection of the pelvic glands very definite. All hope of apparent cure is, therefore, impossible, but the very great symptomatic improvement, which usually follows upon radium treatment, is of such inestimable value to the sufferers, that there is ample warrant for the adoption of this procedure when operation is impracticable, and routine treatment has failed to afford relief.

Arrest of hæmorrhage, diminution of discharge, healing of ulceration, lessening of induration, and relief from pain are almost invariably obtained, and though the susceptibility of patients varies within very wide limits, some responding much more speedily and completely than others, yet in almost every instance distinct benefit is observed, and the rate of progress of the disease greatly retarded.

When the disease is confined chiefly to the cervix, and the growth is of the cauliflower or fungating type, removal of as much of the mass as possible by curetting, or local excision, is generally advisable. A radium tube of not less than 100 mgr. activity, screened with 2 mm. of lead, and 3 mm. of rubber, should be introduced into the cervical canal, or if this be impossible into the posterior fornix. Care should be taken to protect the posterior vaginal wall with light gauze packing, as if this precaution be not observed, some degree of proctitis may occur, and distress the patient considerably. The action of the radium tube should be supplemented by that of a radium plate of 100 mgr. screened in similar fashion, and applied on the abdominal wall over the fundus of the uterus. A total exposure of between twenty-four and thirty hours should be given, and the treatment repeated at intervals of six weeks or two months, according to the response obtained.

Great care must be exercised in the treatment of any recurrence which may make its appearance after the performance of a complete Wertheim's operation. The functions of the trophic nerves of the pelvis seem often to be impaired seriously by the extensive and elaborate dissection which is associated with this method of hysterectomy. For this reason, if the patient be treated within six months of the date of operation, the amount of radium used should be small, not exceeding 50 mgr. The screen should be not less than 2 mm. of lead, and the total exposure not longer than fifteen to twenty hours, extended over four or five days. Unless these precautions be observed, a severe and extensive destructive reaction may follow the application of radium.

In cases of carcinoma of the body of the uterus, the best results

are obtained by the introduction of a tube of 100 mgr. screened with 1 mm. of silver, and applied actually within the uterine cavity for a period of twenty-four hours.

Carcinoma of Uterus. Case No. 1337, F., aged 46. The patient had a very extensive growth involving the whole of the cervix, and extending forwards on the left side to the base of the bladder. There was a profuse offensive vaginal discharge. Two operations were performed in September and October, 1913, the surgeon excising and scraping away as much of the growth as was possible by the vaginal route.

The patient received radium treatment in December, 1913, January and March, 1914. Steady improvement followed, the discharge and bleeding ceased, the ulcerated surfaces healed, and the disease was arrested, patient rapidly regaining health and strength.

Her medical man reported in January, 1918, "I am pleased to say the patient has kept quite free from any recurrence of the carcinoma."

Carcinoma of Uterus. Case No. 382, F., aged 68. This patient was first seen in January, 1913. The cervix was enlarged and indurated, a cauliflower growth protruded from its posterior lip, and extended on to left side of vagina. The left broad ligament was much infiltrated. There was an offensive sanguineo-purulent vaginal discharge.

The condition had been declared inoperable by a consulting gynaecological surgeon. The patient received treatment in February, April and October, 1913, and March, 1914. The cauliflower-like growth disappeared, the ulceration healed, the induration became less, the vaginal discharge ceased, the patient gained in strength, and put on flesh. From March till the end of September, 1914, she was apparently quite well.

In October, 1914, symptoms indicative of kidney disease appeared, and the patient died of uraemia, January, 1916.

There had been no recrudescence of the local trouble.

Carcinoma of Uterus. Case No. 5348, F., aged 34. This patient was referred to the Radium Institute for treatment in February, 1913, suffering from inoperable carcinoma of cervix. There was great induration and ulceration of the cervix, and the anterior, left lateral, and posterior vaginal walls were much infiltrated and tender. There was a profuse sanguineo-purulent discharge. She received treatments at intervals varying from two to six months, the last one being given in July, 1916.

She last reported in February, 1918.

Her general condition was excellent. No bleeding, no discharge, no pain. There was extensive fibrosis of the vaginal walls, the orifice being exceedingly small.

She had gained in weight and was fully equal to all her household duties.

CARCINOMA OF THE RECTUM. The results obtained from the treatment of carcinoma of the rectum are by no means constant or uniform, and it is often extremely difficult to predict what, if any, benefit will follow upon radium irradiation. In some instances, however, growths which have been regarded as inoperable have been so much improved by the action of the radium rays, their size and vascularity being so diminished, and the degree of fixation so lessened, that tumours, which before treatment had been declared inoperable, have at a subsequent date been successfully removed, and the patients have remained free from recurrence. ulceration, arrest of rate of growth, checking of rectal hœmorrhage, and postponement of the date at which the operation of colostomy becomes imperative.

The best results are usually obtained in cases where the growth is annular in type, spongy in character, and situate in the upper half of the rectum. The plaque-like infiltrating growth is not nearly so amenable, and the action of the radium rays on the unaffected portion of the rectal wall generally produces a somewhat severe proctitis, which may persist for six weeks, two months, or even longer.

The routine treatment consists in a total exposure of twenty-four to thirty hours duration with a 100 mgr. tube screened with 2 mm. of lead and applied in actual contact with the growth. If the main portion of the tumour be situate on the posterior rectal wall, an applicator containing 80 to 100 mgr. screened in similar fashion may be placed over the sacrum at the level of the growth.

Carcinoma of Rectum. Case No. 225, M., aged 70. This patient's rectum was excised for malignant disease in 1901. Recurrence in the anal canal appeared in April, 1912, and was excised. A second recurrence took place in October, 1912, and was declared inoperable.

When seen in October, 1912, there was a hard carcinomatous ulcer three centimetres in length, on the left rectal wall immediately inside the anal opening, with much surrounding induration extending into the left buttock.

The patient received treatment in October and November, 1912. The ulceration healed, and the growth and induration were replaced by fibrous tissue which caused a stricture of the canal necessitating occasional dilation with bougies. The patient reports himself for examination from time to time.

He was last seen in January, 1918, in good general health.

Carcinoma of Rectum. Case No. 35, M., aged 35. The patient came to the Institute in October, 1911, for the treatment of a large ulcerated carcinomatous growth in the lower half of the rectum, which an eminent surgeon had declared to be inoperable.

He received treatment in October with the result that the ulceration healed, and the growth became reduced in size, and much less fixed to the surrounding tissues.

Early in December, 1911, he was referred to his surgeon, who found the condition so greatly improved that operation was practicable. Kraske's operation was accordingly performed, and the patient subsequently received a course of prophylactic irradiation. He made an excellent recovery, and when he last reported in February, 1917, was in perfect health, and leading an active and busy life.

Carcinoma of Rectum. Case No. 752, M., aged 74. This patient received treatment at the Institute in October, 1913, for an almost annular malignant growth in the upper part of the rectum, which had been declared inoperable. When examined early in January, 1914, the growth was found to be much diminished in size, and not so fixed as before the treatment.

Operation was then considered to be practicable, and the successive steps were, colostomy, February 3rd, 1914, excision of rectal growth April 1st, 1914, closure of colostomy with restoration of continuity of bowel May 1st, 1914.

The patient made an excellent recovery from these operations, and no recurrence or appearance of secondary visceral deposits were noted.

Carcinoma of Rectum. Case No. 1097, F., aged 40. This patient commenced to suffer from rectal hæmorrhage with excessive mucoid dis-

charge and severe pain in the back in April, 1914. She consulted a leading hospital surgeon at the end of that year, who found a large growth in the upper part of rectal ampulla, inoperable, and gave a gloomy prognosis.

In January, 1916, obstructive constipation became pronounced, and colostomy was advised, but patient strongly objected to this procedure, and radium treatment was suggested.

When examined in January, 1916, a hard irregular ulcerated annular and very firmly fixed growth was found in the upper half of the rectum, the lower border being 8 cm. from the anal margin. The lumen would just admit the tip of the index finger. There were slight tenesmus, occasional rectal hæmorrhages, a profuse mucoid discharge, and constant pain in the back.

The patient was thin, weak, very nervous, and much distressed at the possibility of having to submit to colostomy.

She received treatment in January, April, and October, 1916, and January, May, and November, 1917.

She was last seen in January, 1918. The disease was apparently quiescent, and much of the carcinomatous material had been converted into a fibrous mass. There had been no rectal hæmorrhage since August, and the mucoid discharge was much less. She was able to maintain a satisfactory daily evacuation of the bowels with the aid of drugs. Her general health had greatly improved, and she had gained over a stone in weight.

Carcinoma of Bladder. Inoperable cases of this disease, in which the patient is tolerant of intra-vesical applications may quite justifiably be advised to undergo radium treatment, as great improvement sometimes going on to apparent cure, generally results; more especially in women in whom intra-vesical treatment is comparatively easy of performance.

A 50 mgr. tube screened with 1 mm. of silver is introduced into the bladder through the urethra, and maintained in contact with the growth (the exact position of which has previously been determined by cystoscopy) for two hours each day for five successive days.

If the growth implicates the base of the bladder this is supplemented by a tube of 100 mgr. screened with 2 mm. of lead, and placed in the vagina in contact with the vesico-vaginal septum, but if the anterior bladder wall or fundus of the bladder be affected, a flat applicator of similar strength and screened with 2 mm. of lead is placed on the abdominal wall just above the pubes. The total exposure in these situations should be from twenty-four to thirty hours in duration.

Definite symptomatic improvement is usually evident in about three weeks, and in the most favourable cases healing of the ulcer, with the transformation of the carcinomatous material into a fibrous mass takes place.

Carcinoma of Bladder. Case No. 800, F., aged 56. This patient was sent to the Institute in October, 1913, for the treatment of a large malignant ulcer with fungating edges situate on the left bladder wall just above the left ureteral ordifice. It had been declared inoperable.

The patient was much troubled by hæmaturia, pain, and difficulty of micturition.

She was treated during October, 1913, March and June 1914. Cystoscopic examination in September, 1914, revealed no sign of the growth.

Her medical attendant reported that he last saw the patient in 1915,

and she was then perfectly well. She left the neighbourhood shortly afterwards and he had lost sight of her.

Carcinoma of Bladder. Case No. 5358, F., aged 39. This patient began to suffer from severe pelvic pain with frequency of micturition and slight hæmaturia in October, 1912.

An exploratory cystotomy was performed at the end of January, 1913, and a large flat carcinoma involving the whole of the left side of the bladder was found. It was quite inoperable.

The patient received six series of treatment between March and October, 1913.

The growth slowly disappeared and all symptoms vanished. Her surgeon reported "I last saw this patient and cystoscoped her early in 1917. She was then perfectly well, and there was no trace whatever of any recurrence of the growth."

CARCINOMA OF BREAST. The number of patients suffering from this disease and applying for treatment far exceeds that of any other malignant condition, but the cases in which operation is at all practicable are invariably advised to submit to surgical measures, with the result that those treated are nearly all in an extremely advanced state with extensive lymphatic involvement. It is interesting to note, however, that in some instances results are obtained which exceed the most sanguine anticipation, and patients, who have received an extremely grave prognosis from their medical attendants, have falsified these predictions in a very striking manner, and have remained comparatively free from the discomfort and distress usually attendant upon the disease, and been enabled to carry out their ordinary duties. These phenomena are more frequently noted when the manifestations of the disease are chiefly superficial in character, and confined to the skin of the operation area, and the axillary and supra-clavicular glands. When involvement of the deeper lymphatics is evident, and the lungs, or any of the abdominal viscera are affected, but little can be looked for beyond possible retardation of the rate of progress, and the prevention of extensive ulceration.

Superficial ulcerations unaccompanied by much subjacent induration are peculiarly susceptible to the action of radium and an exposure of eighteen to twenty-four hours' duration with flat applicators screened with 1 mm. of silver will often produce rapid and complete healing.

The routine treatment of small and closely aggregated cutaneous and subcutaneous nodules, and of infected and enlarged lymphatic glands with much subjacent induration, is carried out by exposures of twenty-four to thirty hours' duration with powerful applicators screened with 2 mm. of lead and repeated at intervals of two or three months. By this measure the disease can often be rendered quiescent for a period of two or three years, or even longer; though it has to be noted that a stage is at last reached when the response to radium treatment becomes negligible, and the disease then makes rapid progress.

When pulmonary involvement is present, and is accompanied by pleuritic effusion, the performance of paracentesis, afterwards followed by irradiation of the affected portions of the lungs with heavily screened and powerful apparatus may effectually prevent the further formation of effusion.

Large isolated and firmly fixed nodules, inoperable by reason of their attachment to the sternum, ribs, or clavicle, are best treated by the radiation of a powerful emanation tube, screened with 1 mm. of silver, and inserted into their substance for twenty-four hours. But little local dis-

turbance results, and the nodule slowly shrinks, or sometimes completely disappears.

Cases of atrophic scirrhus in patients over sixty years of age may be kept in check for an almost indefinite time by radium irradiations repeated every three or four months; the growths cease to trouble the patients to any considerable degree; death being brought about by some unassociated illness.

Swelling of the arm and hand from lymphatic obstruction will often be considerably relieved if treated before the engorgement has existed for so long a time as to render the tissues tense and brawny, and in these instances special attention must be paid to the thorough irradiation of any infiltrated areas which may be present in the axillary or supra-clavicular regions, and at the upper part of the lymphatic trunks.

Rapidly-growing carcinomata of the medullary type in young and corpulent patients are but little affected by radium, and not much benefit, other than possible relief from pain, is likely to follow the employment of even very large doses.

Carcinoma of Breast. Case No. 1125, F., aged 47. This patient had her right breast removed and axilla cleared out for malignant disease in July, 1911.

In June, 1913, she began to suffer from severe pain in the right axilla, right arm, and right side of chest.

She consulted her surgeon who found a recurrence in the axilla, and advised radium treatment.

When examined, considerable induration and thickening were found to be present in the right axilla, and there was also induration in the left supraclavicular fossa, which was very tender on pressure. She was treated during February, 1914, and by April all induration had disappeared, and she no longer had any pain.

She has since kept perfectly well, and wrote in January, 1918, saying she was better than she had been for many years.

Carcinoma of Breast. Case No. 151, F., aged 64. This patient underwent Halsted's operation on the right side in June, 1911. Recurrence in the outer pectoral region with much induration and swelling of the right arm appeared early in February, 1912.

She was treated in March and April, 1913, and again in January and March, 1914. All signs of the disease disappeared, and when last examined in April, 1917, no indication of any malignant trouble could be detected.

Carcinoma of Breast. Case No. 854, F., aged 51. This patient's right breast was removed in May, 1912. Recurrence took place in scar in September, 1913, and was declared inoperable. When the patient was first seen in November, 1913, there was a chain of nodules varying in size from a pea to a hazel nut along the whole length of the operation scar. There were enlarged glands in the axilla and in the right supraclavicular fossa. The pain in the affected area was very severe.

She received treatment in November, 1913, and February and April, 1914.

All the nodules and enlarged glands disappeared, and the pain was abolished, the patient rapidly put on flesh, and regained her strength.

She was last examined in January, 1918. No trace of the disease could be found, and she expressed herself as feeling perfectly well.

Carcinoma of Breast (Recurrent). Case No. 5003, F., aged 48. This patient was first seen in January, 1914. Her left breast had been

removed in 1906, and the left axilla cleared out in 1909 for a recurrence in the glands in that situation. She subsequently underwent several operations for excision of various carcinomatous nodules, the last operation being in 1912. In 1913 multiple recurrences appeared and further operation was declared impracticable. When examined there was a large nodule at the inferior extremity of operation scar, and three indurated masses in the left axilla. The left supraclavicular glands were enlarged.

She received treatment in January, March, and April, 1914. The nodule, indurated axillary masses, and supraclavicular glands slowly but steadily disappeared and her general health rapidly improved. She was last examined in October, 1917.

No trace of the disease could be detected.

Carcinoma of Breast (Recurrent). Case No. 5417, F., aged 41. This patient's left breast and axillary glands were removed in 1911 for carcinoma, recurrence taking place in the scar a year later.

When first seen at the Institute in May, 1913, there was a large hard growth occupying the whole left mammary region, and at its apex was an ulcer measuring 8 x 4 centimetres. The growth was very tender and patient suffered much pain.

She received six series of treatment between May, 1913, and May, 1914 which resulted in complete healing of the ulceration and disappearance of the tumour.

In May, 1917, she again came for the treatment of a fresh recurrence at the old site, there then being an almost circular nodule 6.5 centimetres in diameter. Its apex was superficially ulcerated. She received four series of treatment May to November, 1917, and when last seen in January, 1918, great improvement had resulted, the ulceration was almost healed, the nodule reduced in size, and her general health excellent.

Duct Carcinoma of Breast. Case No. 428, F., aged 49. This patient's left breast had been removed for duct carcinoma in May, 1912.

In February, 1913, the right breast was found to be affected and an operation was advised, which patient refused.

When seen in March, 1913, there was a hard nodule the size of a tangerine orange in the centre of the breast immediately under the nipple, which was retracted. There was a sanguineous discharge from the nipple, the breast was very tender and the site of frequent lancinating pains. The breast was not fixed, but there was impairment of mobility. The right axillary glands were not affected.

Patient has received treatment first at three, and afterwards at six monthly intervals up till June, 1916.

When last examined in January, 1918, the growth had been converted into a mass the size of a filbert, and there was no longer any discharge, tenderness, or pain.

The patient was looking and feeling well.

Carcinoma of Breast. Case No. 1451, F., aged 75. The patient came to the Institute in July, 1914, for the treatment of a large hard firmly fixed oval growth situated over the the junction of the fourth right costal cartilage with the sternum, and measuring 6 x 4.5 x 2 cms. It was not very tender on pressure, but was the starting point of frequent attacks of severe pain which radiated all over the chest and down the right arm.

She received treatment in July, and the exposures were followed by definite shrinking of the growth and disappearance of the pain. No further treatment proved necessary, and her medical man reported that

the growth had become atrophic and ceased to trouble the patient in any way.

She died at the end of 1917 from cerebral hæmorrhage.

Rodent Ulcer. Of all forms of malignant disease this is the one which is most amenable to radium treatment. Cases which have not received previous treatment with CO_2, ionisation, X-rays, etc, in which the lesion does not exceed 3-4 cms. in diameter, and does not implicate cartilage, bone, or mucous membranes, can almost invariably be cured by one, or perhaps two exposures with powerful unscreened applicators. Care must be taken, however, in treating these lesions to radiate the tissues well beyond the margin as appreciable by sight or touch, and to give a prolonged exposure, the length of time being duly proportioned to the character of the lesion—hypertrophic or ulcerative—and to the amount of circumjacent or subjacent induration which is present. Unless these precautions be taken, recurrence will usually be noted within twelve months' time, and these recurrences show a great tendency to appear at the margins of the former lesion. When any extensive implication of the mucous membrane, more especially of the nasal mucous membrane, is present, prognosis must be very guarded, as it appears almost impossible completely to eradicate the disease in these situations, unless the area involved be very small; and although rapid and considerable improvement often follows the first two or three exposures, the disease rarely appears to be cured, and small but definite recurrent foci constantly appear. An exception may perhaps be made when the disease affects the palpebral mucosa, as lesions in this situation frequently respond in the most satisfactory fashion, and the tendency to recurrence is but slight. If, on the other hand, the ocular conjunctiva, sclerotic, or cornea be affected, the condition proves most intractable and may necessitate removal of the eyeball.

During the first two or three years of the work of the Radium Institute, numerous patients presented themselves for treatment in whom the disease had existed for many years, and in which great destruction of the cheek, nose, and upper lip was present, the whole of the nasal mucosa being involved, and perforation of the hard palate existent. Cure of such conditions was impossible; but little could be done to help these unfortunate sufferers beyond giving them irradiation with heavily screened rays at intervals of two or three months. Some slight benefit was evidenced by retardation of the rate of progress, healing of some ulcerated areas, and alleviation of pain, but this was the utmost ever obtained. Recently, however, but very few cases of this character have been seen, which may possibly be due in some measure to the fact that the radium treatment of rodent ulcer in its early stage is now becoming more widely known to medical men, and the disease is thus checked at the outset.

Rodent Ulcer. Case No. 5784, F., aged 62. A rodent ulcer of six years' duration which had proved refractory to all treatment. It affected the left temple, measured 4.3 x 3 cm. and was of a perfectly typical character.

Two treatments were given, one in August and one in October, 1914. Complete healing occurred, but at end of April, 1915, two tiny recurrent nodules appeared at the upper edge of the scar. A further treatment was at once given, and patient has since remained perfectly well.

Rodent Ulcer of Ala Nasi. Case No. 175, M., aged 65. The patient was seen and treated in March, 1912, for a rodent ulcer of three years'

duration which was situate on the right side of the nose, and had almost perforated it, the floor being extremely thin and composed of but little more than nasal mucous membrane. He received one treatment only, which was followed by complete healing of the ulcer without perforation.

He last reported in January, 1918—perfectly well.

Rodent Ulcer of Nose. Case No. 1693, M., aged 65. The disease had existed for 20 years, and had been treated by excision, scraping, caustics, and X-rays, but had proved most refractory. It had destroyed the whole of the right side of the nose exposing the septum for its entire extent.

When seen in February, 1915, it had become very active and was beginning to invade the right inner canthus, left side of nose, and upper lip.

The patient was treated during February and July, 1915, the spread of the disease was arrested and healing and repair occurred at the edges with consequent narrowing of the exposed area, and a striking improvement in the patient's personal appearance.

He last reported at the end of 1916. The disease was quiescent, and no further exposures were considered necessary or advisable.

Rodent Ulcer of Inner Canthus. Right Eye. Case No. 5261, F., aged 41. The patient presented herself for treatment in October, 1912, the disease having existed for two years. There was then a raised crescentic growth 1.2 cm. in diameter, completely surrounding the right inner canthus, and implicating the adjacent palpebral mucosa. There was a slightly purulent conjunctival discharge, and occasional hæmorrhage.

She received in all four exposures in October, and December, 1912, January and March, 1913. By April all trace of the growth had disappeared, the discharge and hæmorrhage had ceased, and the palpebral mucosa was normal. There has been no recurrence.

Sarcomata. The results of the radium treatment of sarcomata are on the whole more satisfactory than those of any other form of malignant disease, with the exception of rodent ulcer. If treated in their early stages and before dissemination by the bloodstream has occurred, the effects are most gratifying. Vigorous treatment is, however, imperative, and whenever practicable the tumours should be treated, both by the insertion of emanation tubes screened with 1 mm. of silver actually into their substance, and by external radiation with powerful and heavily screened apparatus. The best and most rapid results are obtained in lympho-sarcomata, and the disappearance of these tumours when the dosage has been correctly proportioned is but little short of marvellous.

Sarcomata of the tonsil and post-nasal space also respond extremely well, and the same may be said, though the response is not quite so uniform, in cases of periosteal sarcomata. It is interesting to note that in this last class of tumour, the percentage of recurrence is but slight, and cases are recorded in which the patient has remained free from any manifestation of the trouble for a period of more than four years. In some instances the sarcomatous mass disappears almost completely, in others it shrinks very considerably, and becomes replaced by dense fibrous tissues. Melanotic sarcomata as a rule prove non-amenable to radium therapy, but in two instances—one a melanotic sarcoma of the choroid, and the other a melanotic sarcoma of the skin of the back—complete disappearance of the primary growth followed on the treatment. In the former case, the patient, a woman, has remained well for two years; in the latter, a youth of twenty-one, secondary deposits appeared in the brain and lungs about fifteen months after the termination of treatment.

The group of tumours formerly classified as myeloid sarcomata, but now termed myelomata, and regarded as non-malignant, behave in a most puzzling fashion, and though some few are benefited by the introduction of radium into the centre of the growth, in the majority of instances but little good results.

Lympho-Sarcoma of Neck. Case No. 50, M., aged 41. This patient first came to the Institute in October, 1911, for the treatment of a large and rapidly growing recurrence on the right side of his neck.

The growth was hard, prominent, and firmly fixed, and measured 6.5 x 4 x 1.3cm. The investing skin was glazed and hyperæmic. Two attempts at removal had previously been made in April and August, 1911, but recurrence had speedily taken place, and further operation was considered impracticable.

Microscopical examination of the portions removed showed it to be a lymphosarcoma.

The patient received in all 14 treatments from October, 1911, to January, 1912. The growth steadily decreased in size, and by the end of February, 1912 had completely disappeared.

The patient last reported himself in January, 1917. There had been no recurrence.

He had gained nearly a stone in weight, was in excellent health, and was leading an active and busy life.

Periosteal Sarcoma of Right Thigh. Case No. 4901, F., aged 32. This patient was first seen in February, 1914. She then had a large firm fixed growth the size of a small cocoa nut on the outer aspect of the upper third of the right thigh. Two attempts had been made to remove it by operation but without success, and the tumour had grown rapidly. Amputation at the hip joint had been suggested, but declined. The patient was unable to stand or walk, and the pain was so severe that she had to be kept constantly under the influence of opiates. Microscopical examination of portions removed at the operation showed it to be a spindle-celled sarcoma. She was treated during February and April, 1914. Rapid and steady improvement followed, the growth quickly shrank, becoming converted into a dense fibrous nodule, the size of a small lemon. All pain disappeared and she speedily regained her health and strength. No further treatment has been necessary, and at the present date the patient is in excellent health, walks, dances, cycles, and swims perfectly, and is working from ten to twelve hours a day.

Sarcoma of Clavicle. Case No. 67, F., aged 62. This patient was sent to the Institute in June, 1913, for the treatment of a large rapidly growing periosteal sarcoma of the right clavicle, which had been present for four months. An attempt at its removal had been made in May, but the surgeon found this could only be done if Berger's operation were performed, and patient would not consent to this procedure.

The growth formed a prominent tumour filling up the right supraclavicular fossa and measuring 10.5 x 6 x 2 cms.; it was very firmly fixed to the clavicle. Microscopical examination of portions removed showed it to be a round-celled sarcoma. A 100 mgr. tube screened with 1 mm. of silver was buried in the tumour for 24 hours. The growth steadily shrank, and by the end of July no trace of it remained.

The patient was last examined in January, 1918. There had been no recurrence, and all movements of the right arm could be performed fully and freely.

Sarcoma of Superior Maxilla (Right). Case No. 140, F., aged 15. Excision of the right superior maxilla was performed on this patient at the end of January, 1912, for a growth in the antrum, which had caused bulging of the right cheek, and right side of the palate. Microscopical examination showed it to be a round-celled sarcoma. Recurrence took place in the sphenoidal region almost immediately after the operation.

The patient was seen and treated in February, 1912. By the end of June all signs of the recurrence had disappeared, and the operation wound had healed perfectly.

She reports herself at intervals for examination. She was last seen in March, 1917. In excellent health.

Sarcoma of Neck. Case No. 1336, M., aged 69. A recurrence in the scar after excision. The original growth had been examined microscopically and proved to be a round-celled sarcoma.

When seen there was a definite nodule measuring 3 x 2 cm. on the right side of the neck implicating the operation scar.

The patient was examined and treated in May, 1914.

The growth had disappeared completely by the end of July, 1914. The last report, received in December, 1916, stated that the patient was perfectly well, and that there was no sign of any recurrence.

Sarcoma of Parotid. Case No. 673, M., aged 49. An extensive recurrence in operation scar after two excisions. Verified microscopically. Seen and treated September, 1913, and March, 1914. The recurrence completely disappeared, leaving a smooth healthy scar. The patient was perfectly well, and working hard in December, 1917.

MEDIASTINAL TUMOUR. Some most remarkable results have been obtained in the treatment of this class of growth, and patients who have presented themselves at the Institute suffering from extreme dyspnœa and orthopnœa, accompanied by severe venous congestion, and disturbance of the sympathetic and recurrent laryngeal nerves, have improved in the most extraordinary manner, and have been enabled to resume their duties, and to indulge in a moderate degree of exercise. It is probable that the majority of these growths are lympho-sarcomata, a fact which accounts for the favourable influence that radium rays exert upon them. The rate of shrinkage of these tumours, as observed by X-ray screening, is often exceedingly rapid, and translucency of portions of the lung, which when first examined threw dense opaque shadows, becomes apparent within four or five weeks. If there be any associated pleuritic effusion, the performance of paractentesis prior to the radium treatment is advisable. The tendency to the further formation of fluid is much diminished or wholly abolished as the result of the radium treatment.

Mediastinal Tumour. Case No. 597, M., aged 44. This patient was first examined at the Institute in June, 1913, the disease then being of one year's duration.

He complained of severe pain in chest which radiated down the left arm, great embarrassment of breathing, and persistent hoarseness. X-ray examination revealed an enormous increase in the median thoracic opacity which extended from clavicle to diaphragm, and horizontally almost to the periphery of the left lung. On the right side it reached to the mammary line. The left side of the diaphragm was immovable. Physical examination showed dullness on percussion of almost the whole of anterior surface of the left, and inner half of the right lung, with absence of breath sounds over this area. There was practically no alteration in the physical

signs posteriorly. He had been seen by two leading physicians who gave a very grave prognosis, and predicted death within three months.

The patient received his first series of treatments in July, 1913, and subsequently had similar exposures at intervals of three or four months, until June, 1917.

Very great benefit resulted, the growth diminishing both in size and density and the pain ceasing to trouble him. The embarrassment of respiration became much lessened, so that he was able to walk five or six miles at a stretch, and the hoarseness disappeared. There were occasional exacerbations and remissions of the symptoms, but the patient kept fairly comfortable, and was able to get about and take an interest in life until June, 1917. In July, 1917, he commenced to go down hill rapidly, the heart's action became much weakened, cyanosis and œdema supervened, and he died of heart failure in October, 1917, four years and three months from the date of his first treatment.

Lymphadenoma. This condition is usually much improved by radium treatment, the response being both rapid and striking. The benefit is most definite when the disease is of comparatively recent origin, and no enlargement of the spleen or mesenteric glands is appreciable. It is not possible, however, to speak of actual cure of this condition, the majority of patients requiring the irradiation to be repeated at intervals of four to six months. In some few cases, especially those treated in the earliest stages of the disease, the effect is more persistent and patients can go for eighteen months or two years without further treatment. It is necessary to employ heavy dosage with powerful applicators screened with 2 mm. of lead, and this procedure usually occasions some definite amount of systemic disturbance, evidenced by languor, nausea, and slight rise of temperature. These symptoms are, however, quite transient; they usually appear within a week of the termination of the treatment, and persist only for four or five days.

Lymphadenoma. Case No. 903, M., aged 45. This patient had noticed gradual enlargement of the glands in both sides of his neck for about two years, when he came for consultation in November, 1914. The glands were then increasing rapidly, and other considerable masses were found in both axillæ and both groins: the spleen was much enlarged and extended down to the umbilicus. Treatment was given by means of powerful applicators screened with 2 mm. of lead and arranged so as to ray the glands and spleen, at intervals of two to four months up to 1917. The disease has been so controlled that the patient has been enabled to resume all his ordinary work. He has joined the Volunteers, and during the past year frequently has marched as much as fifteen miles.

He was seen in January, 1918, when there were still pea-sized glands to be felt, and the spleen projected slightly below the costal margin; but as he had no symptoms treatment has been deferred for the time being.

Lymphadenoma. Case No. 5563, F., aged 22. This patient was seen first in November, 1913, when she gave a history of a swelling which had appeared above her right clavicle in 1912, increasing slowly. Under treatment by arsenic this became reduced, but there remained an irregular hard nodular mass, projecting from the surface and fixed to the deep tissues. This was rayed by plates arranged to cross-fire the swelling, a full dose being given on eight occasions at intervals of about eight weeks. Treatment was then suspended, as the glands were reduced to pea-sized nodules, movable in the subcutaneous tissues. The patient continued to

report for examination every three months till 1917, when she ceased attending on the understanding that she should come at once if the disease showed further activity.

Fibroid Disease of the Uterus. The menorrhagia and metrorrhagia which are such frequent concomitants of this disease are, as a general rule, much lessened, or even abolished by radium treatment, and even in instances where operation has been contemplated and advised as the only method likely to prove effective in relieving the patient of these distressing symptoms, radium has obviated the necessity of this somewhat heroic procedure.

The routine treatment consists in the introduction of a 100 mgr. tube screened with 2 mm. of lead and 3 mm. of rubber into the cavity of the uterus, or if this be impracticable, into the posterior fornix, supplemented with a plate of 80-100 mgr. screened in similar fashion and applied externally over the fundus. In many cases definite shrinkage of the growth takes place, though this result is not so regular an occurrence as the diminution in the amount of uterine hæmorrhage. In uterine fibrosis unassociated with the presence of actual fibromata, good results are often obtained, though about twenty per cent. of such cases prove non-amenable to radium therapy, and hysterectomy has ultimately to be performed. The total exposure should be not less than thirty hours' duration, and it will probably have to be repeated in five or six months. The period immediately following the application of the radium is usually more profuse than before, then the metrorrhaia is checked, and this is followed by a progressive decrease of the menorrhagia, until the amount becomes normal, or, as is occasionally seen in extremely susceptible subjects, amenorrhœa occurs, and persists for three to six months or even longer.

If the exposures have to be repeated three, four or more times, premature establishment of the menopause may be produced, and this possibility must, therefore, be made clear to the patients before commencing their treatment.

Fibroid Disease of Uterus. Case No. 1023, F., aged 45. When first examined in December, 1913, this patient was found to have a large fibroma of the uterus reaching as high as the umbilicus, its surface was smooth and it was freely movable. There was severe menorrhagia lasting for seven days at each period.

The patient received treatment during January, September, and December, 1914, and February, 1915.

The menorrhagia steadily diminished and the tumour lessened in size. Amenorrhœa occurred in December, 1914, and has been permanent. The fibroid shrank to one-fourth of its former size, and ceased to trouble the patient in every way.

She last reported in November, 1917, and was in excellent health.

Fibroid Disease of Uterus. Case No. 237, F., aged 26. The disease in this instance was of three years' duration. Dysmenorrhœa and menorrhagia were very severe. The uterus had been curetted, but with little benefit to the patient, and hysterectomy had been advised.

The patient was first seen in June, 1912. She stated that her menstrual period lasted for seven days, the flow being excessive, and the pain for the first three days so severe that she was unable to leave her bed. The uterine fundus could just be felt above the pubes, and the cervix was elongated, hypertrophied, and œdematous. The enlargement of the uterus was uniform, and no actual fibromata were appreciable.

She received in all seven series of treatments, in June, July, and November, 1912, May 1913, February and April, 1914, and September, 1915. Definite benefit was noted from the first, and though there were occasional exacerbations of the symptoms, improvement proceeded at an almost uniform rate, the dysmenorrhœa becoming less and less troublesome, and the amount of blood lost steadily decreasing. When last examined in September, 1915, the uterus was found to be but little larger than normal, her periods lasted only two or three days, the amount lost was very slight, and she had no pain. She was of good colour, and had put on flesh.

A report received in January, 1918, stated that amenorrhœa had existed since October, 1915—premature induction of the menopause—that the patient was in excellent health, quite strong, and able to do her work well.

Papilloma of the Bladder. Most of the cases of this nature, treated at the Radium Institute, are those in which recurrence has taken place after the performance of a suprapubic cystotomy, and the patients have been averse from further operation. The most troublesome and to the patient most alarming symptom is the persistent and profuse hæmaturia, and this is often controlled, sometimes totally checked, by radium treatment.

Large flat applicators are used, screened with 2 mm. of lead and applied low down on the abdominal wall over the fundus of the bladder. In female patients this may be supplemented by a 100 mgr. tube screened with 2 mm. of lead and applied in the vagina. If the patient is tolerant of intra-vesical instrumentation a 50 mgr. tube screened with 1 mm. of silver may be introduced into the bladder, and an exposure of two hours' duration given daily in this situation on five successive days. In favourable cases the effect is fairly prolonged, and exposures have only to be repeated at intervals of nine or twelve months. Cystoscopic examination shows the radium to exert a most definite effect upon the papillomatous masses, which shrink very considerably in size, and sometimes become quite avascular.

Papilloma of Bladder. Case No. 313, M., aged 62. A large papillomatous growth was removed from the posterior wall of this patient's bladder by supra-pubic cystotomy in September, 1909.

He kept well until June, 1912, when hæmaturia appeared. He was again cystoscoped and two papillomatous masses were found on anterior wall of bladder. The patient declined further operation. He received radium treatment in July, 1912, and this was followed by a complete cessation of the hæmaturia. As a prophylactic measure he came for short treatments every three months until July, 1913, and kept free from further trouble. In August, 1915, hæmaturia was once more noted and the patient was therefore given a course of five days' treatment which proved effective until August, 1915, when the passage of some small blood clots in the urine occurred. Another long treatment was administered at the end of August, 1915, with excellent result, the patient keeping well until the end of October, 1916. The urine then became slightly coloured, and it being inconvenient for the patient to attend for further radium exposures he has since received occasional treatments with X-rays.

He last reported in February, 1918, and was in good health.

Papilloma of Bladder. Case No. 2276, M., aged 52. This patient underwent the operation of suprapubic cystotomy in November, 1912, for

the excision of numerous small papillomata of the bladder. Early in 1916 undue frequency of micturition and occasional difficulty in emptying the bladder were noted, and in September hæmaturia re-appeared, and lasted for three or four days. Cystoscopic examination revealed a recurrence, there being a large papillomatous growth on the posterior bladder wall, and numerous small papillomata in various other places, some of which formed a fringe round the internal meatus. The patient declined further operation and radium treatment was advised.

He was treated at the Institute in October, 1916, and was again cystoscoped by his surgeon in January, 1917, who reported that the large growth on the posterior wall had diminished to the size of a pea, and that the other small masses were much stunted, the villi being blunt and clubbed. The hæmaturia had disappeared, and the patient was in excellent health.

The patient was given a second course of exposures in February, 1917, and since that date no further treatment has proved necessary, though he had a slight attack of hæmaturia in August, 1917, following on some rather severe exertion.

His surgeon reported in February, 1918, that the patient was keeping well.

Lupus Vulgaris. Treatment with Finsen Light is usually preferable to radium therapy in this condition, but cases which have proved non-amenable to the former method will frequently yield to the latter one. A destructive reaction has, however, to be produced, and exposures should be from one to one and a half hours' duration with strong applicators unscreened. This produces a definite reaction with formation of a crust, which on separation leaves a white, smooth and supple scar. If care be taken to treat well beyond the appreciable border of the lesion, recurrence is very infrequent.

Lupus Vulgaris. Case No. 1714, F., aged 39. This patient had suffered from lupus of the right side of the neck for twenty years. For the last ten years she had been treated with Finsen Light which had kept the disease in check, but failed to cure it.

She was seen and treated at the Institute in April, 1915. There was then a broad band of scar tissue on the right side of the neck, extending from the lobule of the ear to the level of the hyoid bone. In its centre was a red ulcerated patch 2 x 1 cm. in extent, and diascopy revealed numerous "apple jelly" nodules all over this area.

She received one unscreened exposure of 10 hours' duration. Perfect healing resulted. The patient was last seen in January, 1918, and no trace of the disease was appreciable

Keloid. This condition gives most excellent results when treated with radium, and when it is of recent origin and occurs in young subjects, great improvement,, if not complete cure, can be safely predicted. The extreme tenderness and irritability so often associated with these lesions usually disappears within a short time of the first exposures.

Apparatus screened with 1 mm. of silver should be employed, and exposures of six hours' duration on each of three successive days given, and repeated at intervals of six weeks or two months. By this method a gradual absorption of the keloidal tissues and a restoration of the skin colour to the normal tint is obtained. Some old and very dense keloids occasionally prove refractory to this method of treatment, and in such instances the screening should be altered to 1/10 mm. of lead, and an ex-

posure of two to four hours' duration given. Some amount of diffuse destruction follows this procedure, and a smooth white scar may result. There appears to be little or no tendency for the keloid to recur, but it is to be noted that the resistant power of the tissues is very considerably diminished, and in two or three instances when a slight abrasion of the old keloidal areas has been produced and septic infection followed, an obstinate and indolent ulceration has occurred and persisted for three or four months before complete healing has been obtained.

Keloid of Face and Hands. Case No. 13, F., aged 27. An extensive dense prominent bright red keloid affecting the forehead, nose, both cheeks, and upper lip, and greatly disfiguring the patient. The dorsal surfaces of both hands, and the thumb, first and second fingers of the left hand, were also implicated. The keloids had appeared in the scars which resulted from a petrol burn.

The patient was seen and treated from September, 1911, to May, 1912, the result being most satisfactory, all the keloidal tissues being absorbed, and the skin of the face and hands regaining its normal appearance and colour.

Some months later the the patient accidentally abraded the skin of her left hand, septic infection occurred, and a painful indolent ulceration took place and proved very intractable. Complete repair was, however, finally obtained, and there has been no further trouble.

The patient last reported in December, 1917. No trace of the lesions remained.

Lupus Erythematosus. Early cases of this disease which have not been subjected to much other treatment, and have not a very extensive distribution, often respond well to radium treatment, but the results are by no means uniform, and some cases prove very intractable. When good results are obtained they usually follow upon exposures of from thirty to sixty minutes' duration, with apparatus unscreened, or screened with 1/100 mm. aluminium. Care should be taken to see that the applicator is sufficiently large to reach well beyond the borders of the patch treated.

Recurrences, if they occur, appear usually within six or nine months and the patient should, therefore, be kept under careful observation for that period, so that further treatment may be promptly given when necessary.

Lupus Erythematosus. Case No. 5129, M., aged 24. This patient was seen and treated in April and May, 1912. He then had three typical patches of lupus erythematosus, two on the left and one on the right cheek.

The lesions quickly disappeared, and the patient remained well until November, 1913, when the disease recurred at the old site. Further treatment was given with a satisfactory result, the patient remaining free from further trouble until June, 1914, when the disease once more appeared. This last recurrence speedily yielded to treatment, and when the patient left England at the end of 1914 no sign of the disease remained.

Lichenification of the Skin. This peculiarly intractable form of skin lesion, with its very depressing and intolerable irritation, is almost invariably quickly improved by exposures of ten to fifteen minutes' duration with applicators unscreened, or screened with the thinnest aluminium, and in the majority of cases an absolute cure is obtained, the tendency to recurrence being but slight.

The patients in whom recurrences are noted appear to be of a strongly neurotic type, recurrence being often determined by some sudden shock or severe mental strain.

Lichenification of Neck. Case No. 236, F., aged 31. In this patient the disease had existed for ten years; had resisted all attempts at cure. She was seen and treated in June, 1912, there being then two lesions, one at the lower part of the left posterior cervical triangle, and the other over the anterior surface of the left axillary fold. The irritation was intolerable, and was much aggravated by warmth.

She received one treatment of 10 minutes' duration. Both lesions completely disappeared within a month of the exposure. The patient presented herself again in March, 1913, for the treatment of a fresh patch which had appeared on the right side of the chin. This was treated in similar fashion with equally good result.

No recurrence has taken place.

Pruritus. In that form of pruritus associated with leucoplakia or hyperkeratosis, radium may often be employed with excellent effect, though in cases where no actual lesion exists, and the trouble is purely neurotic in character, the results are not usually so satisfactory.

No definite rules can be laid down for treatment, the length of exposures and the screening to be employed being dependent upon the character and the chronicity of the lesion. In the milder cases, applicators screened with 1/100 mm. of aluminium and exposures of from seven to ten minutes' duration on two successive days, usually prove effective; but if the leucoplakic patches are thickened and extensive, screening of 1 mm. of silver should be resorted to, and exposures of four to six hours' duration given on three successive days.

These cases tend to recur in about six months' time, and the patients must be instructed to return for further treatment directly the trouble again becomes active.

Cavernous Nævi. The final results of the treatment of cavernous nævi may be regarded as eminently satisfactory. Whenever practicable, treatment should be commenced at the earliest possible date. The routine method adopted is the employment of flat applicators screened with 1/10 mm. of lead, and applied in such fashion as thoroughly to irradiate the whole affected area, the length of exposure being graduated according to the age and susceptibility of the patient. It is usual to commence with treatment of half-an-hour's duration on each of three successive days; and the exposures may be carefully lengthened, but it is important to avoid giving a dosage of sufficient intensity to produce vesication. Transient erythema followed by slight desquamation should mark the limit of the reaction. If these cautions be observed, the whole mass slowly shrinks, and is ultimately replaced by fibrous tissue. No tendency to recur has been noted. If the mass be a large one, and the presence of a pulsating vessel can be detected by palpation, ligation of this vessel before treatment is commenced is to be advocated.

Cavernous Nævus of Neck. Case No. 5021, F., aged 1 year. This patient was brought to the Institute in August, 1911, for the treatment of a prominent nævus the size of a large orange situate on the left side of neck, and reaching from the mastoid process to the clavicle.

Treatment with CO_2 snow, and electrolysis had proved quite ineffective, and the tumour was rapidly increasing. The child received treatments at intervals of five to six weeks from August, 1911, to November, 1912.

By June, 1913, all the nævoid tissue had disappeared.

The child was last seen in September, 1917, and nothing beyond some laxity of the skin below the left mastoid was then appreciable.

Cavernous Nævus of Left Parotid Region. Case No. 5230, F., aged 5 months. This infant was first seen in September, 1912. There was then a large lobulated pulpy parti-coloured angiomatous growth measuring 8 x 6.5 x 2 centimetres, extending from the left mastoid process to the left malar bone and involving the lobule of the ear, which was much distorted.

The child was treated first at intervals of six weeks, and later at intervals of three or four months until July, 1915.

Complete absorption of all the nævoid tissue resulted, and when the child was last examined in December, 1917, no trace of the condition remained. A plastic operation had recently been performed for the purpose of improving the appearance of the ear, with an excellent result.

Capillary Naevi. The appearance of these lesions is frequently much improved by radium therapy, but it is rarely, if ever, possible to secure a perfectly normal appearance of the skin. Definite lightening of the colour to an extent which enables the affected areas to be scarcely perceptible when lightly covered with some face powder is often obtained. The factor of personal idiosyncrasy is, however, a very prominent one in these cases, and the utmost care has to be exercised in their treatment. It is usual to commence with short exposures of from twenty-five to fifty minutes' duration with apparatus unscreened, or screened with 1/100 mm. of aluminium, the length of time being sufficient to produce definite vesication without destruction of the deeper layers of the skin. These exposures are repeated three or four times at six weekly intervals, until the area treated assumes a salmon-pink colour. When this result is obtained, the screening is altered to 1/10 mm. or 2/10 mm. of lead, and exposures of two to three hours' duration repeated at three monthly intervals.

The patients must be kept under observation for two or three years, as in many instances a tendency to the formation of telangiectases is noted, and these must promptly be treated with a fine pointed electric cautery directly they appear.

If the lesions be on the face, patients should be warned to protect themselves as much as possible from powerful sunlight, as the liability to freckling seems to be much exaggerated in those areas which have been subjected to many radium irradiations.

Capillary Naevus of Face. Case No. 57, F., aged 11. A somewhat patchy dark purple nævus implicating the left cheek from the lower eyelid to the upper lip. Previous attempts at treatment had resulted in the production of a prominent keloid over the left malar bone.

The patient was first seen in October, 1911, and received treatments at intervals of from three to nine months until September, 1915. She was last seen in January, 1918. All the keloid and much of the nævus had disappeared, and the few small areas which remained were very light in colour, and could easily be hidden by a slight dusting with face powder.

Exophthalmic Goitre. When routine treatment has failed to effect an improvement in this condition, and operation has been regarded as inadvisable, radium treatment may well be tried, as definite symptomatic improvement is usually apparent within six weeks or two months

of the exposures—the tachycardia being lessened, the tremors diminished, the exophthalmos less noticeable, the restlessness and irritability of temper much quietened. In extremely susceptible patients this improvement is, however, sometimes preceded by an exacerbation of all the symptoms, a phenomenon which is probably occasioned by the action of the radium rays at first increasing the influx of thyroid secretion into the blood stream.

Powerful applicators screened with 2 mm. of lead should be used, and arranged so as to secure a maximum cross fire irradiation. An exposure of twenty to thirty hours' duration should be given, and repeated if necessary at intervals of four to six months.

In one or two instances, cases of extreme degree which had produced such definite weakness of the patient that operation was impracticable, have improved to such an extent that at a later date removal of the greater portion of the gland has been successfully performed, and the patients have since remained perfectly well.

Exophthalmic Goitre. Case No. 1645, F., aged 38. This patient first began to exhibit symptoms of exophthalmic goitre in March, 1914, and to suffer from steadily increasing mental fatigue, excessive nervousness, marked tachycardia, and great breathlessness on exertion.

Operative measures had been considered but negatived.

The patient was first seen in March, 1915. She was a tall woman of spare figure. There was a moderate degree of uniform enlargement of the isthmus and both lobes of the thyroid gland. There was a fine tremor of all the limbs aggravated by voluntary movements. The pulse rate was 146, the patient was weak, restless, excitable, and depressed, and was steadily losing flesh. No eye symptoms were present.

She received treatment in March and October, 1915. The first treatment was followed about two weeks later by an exacerbation of all her symptoms lasting for three weeks and rendering the patient worse than she had been before. On this account further treatment was deferred until October, by which time great improvement was manifest. The tremor was scarcely noticeable, the pulse rate had fallen to 92, she was much more restful, less nervous, and no longer depressed. She slept well and was putting on flesh.

Early in 1916 she decided to submit to operation, and this was accordingly performed, the greater part of the gland being removed. The surgeon who operated expressed the opinion that the previous radium treatment had contributed greatly to the successful result.

The report received in October, 1917, stated that the patient was in good general healh, and was working hard.

* * * *

I desire to express my very great indebtedness to my colleague, Dr. J. E. A. Lynham, who has been associated with me in the care and treatment of the cases described. The opinions recorded, and the indications given with respect to the apparatus, screening and exposures to be employed are the result of our joint observations and experience.

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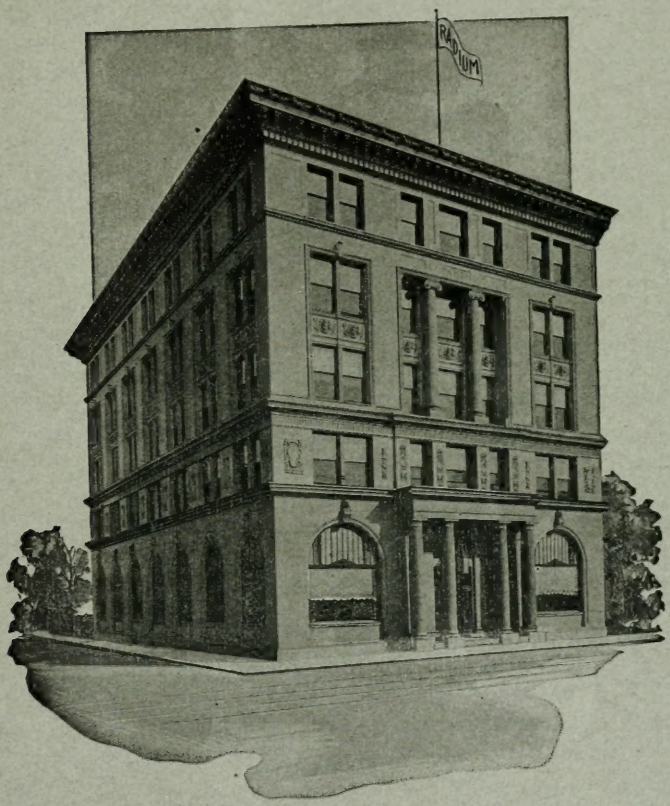

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